CLAIMS

What is claimed is:

1. A spark gap for protecting an electrical circuit from voltage surges comprising:

a first electrical circuit trace element having a first end face of defined thickness and length;

a second electrical circuit trace element having a second end face of defined thickness and length;

said first and second end faces being spaced from each other along their respective lengths to provide an air gap having a defined gap width;

said gap width being of a size to provide a required spark gap breakover voltage under design conditions of temperature, humidity and air pressure; and

said air gap also having a defined gap length corresponding to the length of said first and second end faces, said gap length being of a size that maximizes spark gap life over repeated discharge cycles without introducing undesirable amounts of capacitance.

2. A spark gap according to claim 1, wherein said spark gap is designed for a radio frequency application at a frequency range of 5 MHz to 1 GHz, has a gap width selected to provide a breakover voltage of no more than 2700 volts, and has a gap length selected to develop no more than 1/2 picofarad of capacitance.

3. A spark gap according to claim 1, wherein said gap length is not more than 0.125 - 0.25 inches.

4. A spark gap according to claim 1, wherein said gap width is not more than 0.0015 – 0.005 inches.

5. A spark gap according to claim 1, wherein said gap length is approximately 0.125 - 0.25 inches and said gap width is approximately 0.0015 - 0.005 inches.

6. A spark gap according to claim 1, wherein said spark gap has a breakover voltage that does not exceed 2700 volts.

7. A spark gap according to claim 1, wherein said first and second end faces are of substantially equal length.

8. A spark gap according to claim 1, wherein said first and second end faces are of substantially equal thickness.

9. A spark gap according to claim 1, wherein said first and second end faces are substantially rectangular.

10. A spark gap according to claim 1, wherein said gap width is substantially uniform over said gap length.

11. A method of forming a spark gap for protecting an electrical circuit from voltage surges, comprising:

forming a first electrical circuit trace element with a first end face of defined thickness and length;

forming a second electrical circuit trace element with a second end face of defined thickness and length;

positioning said first and second end faces during said forming steps so as to be spaced from each other along their respective lengths to provide an air gap having a defined gap width;

said gap width being selected based on determination of a required spark gap breakover voltage under design conditions of temperature, humidity and air pressure; and

said air gap also having a defined gap length corresponding to the length of said first and second end faces, said gap length being determined empirically based on consideration of maximizing spark gap life over repeated discharge cycles without introducing undesirable amounts of capacitance.

12. A method according to claim 11, wherein said spark gap is designed for a radio frequency application at a frequency range of 5 MHz to 1 GHz, wherein said gap width is selected to provide a breakover voltage of no more than 2700 volts, and wherein said gap length is selected to develop no more than 1/2 picofarad of capacitance.

13. A method according to claim 11, wherein said gap length is selected to be not more than 0.125 - 0.25 inches.

14. A method according to claim 11, wherein said gap width is selected to be not more than 0.0015 - 0.005 inches.

15. A method according to claim 11, wherein said gap length selected to be approximately 0.125 - 0.25 inches and said gap width is selected to be approximately 0.0015 - 0.005 inches.

16. A method according to claim 11, wherein said spark gap is designed to have a breakover voltage that does not exceed 2700 volts.

17. A method according to claim 11, wherein said first and second end faces are formed to be of substantially equal length.

18. A method according to claim 11, wherein said first and second end faces are formed to be of substantially equal thickness.

19. A method according to claim 11, wherein said first and second end faces are formed to be substantially rectangular.

20. A method according to claim 11, wherein said gap width is selected to be substantially uniform over said gap length.

21. A method according to claim 11, wherein said gap width is less than 0.005 inches and said spark gap is formed by laser etching a single electrical circuit trace element into said first and second electrical circuit trace elements.

22. A method according to claim 21 wherein said laser etching is performed using a YAG laser.

23. In a printed circuit board having a substrate, a plurality of printed circuit traces, and one or more circuit components electrically connected to said circuit traces, a spark gap for protecting said one or more circuit component from voltage surges comprising:

a first electrical circuit trace element having a first end face of defined thickness and length;

a second electrical circuit trace element having a second end face of defined thickness and length;

said first and second end faces being spaced from each other along their respective lengths to provide an air gap having a defined gap width;

said gap width being of a size to provide a required spark gap breakover voltage under design conditions of temperature, humidity and air pressure; and

said air gap also having a defined gap length corresponding to the length of said first and second end faces, said gap length being of a size that maximizes spark gap life over repeated discharge cycles without introducing undesirable amounts of capacitance.